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Inattention, But Not OCD, Predicts the Core Features of Hoarding Disorder

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Abstract

Hoarding Disorder (HD), defined as the acquisition of and failure to discard large volumes of possessions, resulting in clutter that precludes normal use of living spaces, is a common and debilitating condition. Although hoarding has historically been conceptualized as a variant of obsessive-compulsive disorder (OCD), increasing evidence suggests that hoarding might be more closely associated with the symptoms of attention deficit-hyperactivity disorder (ADHD). The aim of the present study was to clarify the relationship between the core features of hoarding (clutter, difficulty discarding, acquiring), OCD symptoms, and ADHD symptoms. HD (N = 39), non-hoarding OCD (N = 26), and healthy control (N = 36) participants underwent careful diagnostic interviewing and completed standardized self-report measures of the core features of hoarding (clutter, difficulty discarding, acquiring), OCD symptoms, negative affect, and the inattentive and hyperactive/impulsive symptoms of ADHD. Multiple linear regressions demonstrated that after controlling for global negative affect, OCD symptoms did not significantly predict any of the core features of HD. Conversely, the inattentive (but not hyperactive/impulsive) symptoms of ADHD significantly predicted severity of clutter, difficulty discarding, and acquiring. These results challenge current conceptualizations of hoarding as a subtype of OCD, and suggest an association with neurocognitive impairment.

Keywords

Hoarding; OCD; ADHD; attention

Hoarding Disorder (HD) is defined as the acquisition of and failure to discard large volumes of possessions, resulting in clutter that precludes normal use of living spaces (Frost & Gross, 1993; Frost & Hartl, 1996). With an estimated prevalence of 2–5% (Iervolino et al., in press; Samuels et al., 2008), HD is associated with high levels of disability and impairment (Tolin, Frost, Steketee, Gray, & Fitch, 2008). Involvement of government agencies, including the public health department, is common due to complaints of unsanitary conditions and of fire risk due to hoarding (Frost, Steketee, & Williams, 2000).

Historically, hoarding has been conceptualized as a variant of obsessive-compulsive disorder (OCD) (e.g., Rasmussen & Eisen, 1992). However, as many as 83% of primary hoarding patients deny symptoms of OCD (Frost, Steketee, Tolin, & Glossner, 2010), and hoarding

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symptoms may correlate less well with OCD symptoms than with other symptoms such as depression (Wu & Watson, 2005). Hoarding has consistently emerged as a discrete symptom factor from other OCD symptoms (e.g. checking, washing) in factor analytic studies of OCD symptoms (see Bloch, Landeros-Weisenberger, Rosario, Pittenger, & Leckman, 2008, for a review), and the hoarding factor demonstrates relatively weak relationships with other OCD symptom factors (Abramowitz, Wheaton, & Storch, 2008; Wu & Watson, 2005).

It could be argued that HD is more closely associated with the symptoms of attention deficit-hyperactivity disorder (ADHD) than with OCD. Recent self-report, neuroimaging, and neuropsychological data converge to suggest that impaired cognitive functions (particularly attention) might be a core feature of hoarding that contributes to decision-making problems. On self-report measures, hoarders describe high levels of attentional impairment (Grisham, Brown, Savage, Steketee, & Barlow, 2007; Hartl, Duffany, Allen, Steketee, & Frost, 2005). In one such study, 20% of hoarders, compared to 4% of OCD patients and 3% of community controls, met adult inattention symptom criteria for ADHD. Furthermore, a full 75% of the hoarding group scored 1 *SD* or more above the mean for age- and gender-matched controls on self-reported inattention symptoms (Ratchford, Frost, Steketee, & Tolin, 2009). Among adult OCD patients, those with hoarding symptoms have nearly a 10-fold risk of ADHD, compared to those without hoarding symptoms (Sheppard et al., 2010), although no such difference was found among child and adolescent OCD patients (Storch et al., 2007).

To date, five studies (Grisham et al., 2007; Grisham, Norberg, Williams, Certoma, & Kadib, 2010; Hartl et al., 2004; Lawrence et al., 2006; Tolin, Villavicencio, Umbach, & Kurtz, 2010) have examined neuropsychological performance in patients with hoarding behaviors [a sixth study (Anderson, Damasio, & Damasio, 2005) assessing patients who developed hoarding behavior after acquired brain lesions will not be reviewed here]. The most robust finding across these studies has been impaired attention (Grisham et al., 2007; Tolin, Villavicencio, et al., 2010), with some additional positive findings in memory (Hartl et al., 2004) and executive functions (2010), a pattern reminiscent of that seen in ADHD patients (Epstein, Johnson, Varia, & Conners, 2001; Kessler et al., 2010).

The hyperactivity-impulsivity symptoms of ADHD may also play a role in hoarding. Excessive, often positively-reinforced acquiring behavior is common in hoarding (Frost & Gross, 1993; Frost et al., 1998; Frost, Tolin, Steketee, Fitch, & Selbo-Bruns, 2009), and hoarding symptoms are prevalent among excessive buyers (Frost, Steketee, & Williams, 2002). Hoarding symptoms have also been found in compulsive gamblers (Frost, Meagher, & Riskind, 2001) and in individuals with trichotillomania and skin picking (Samuels et al., 2002), suggesting some overlap with impulsivity. Using the Continuous Performance Test, Grisham et al. (2007) found that hoarders made more errors of commission than did healthy controls and mixed clinical controls, a finding consistent with impaired behavioral inhibition.

Although an increasing body of evidence suggests that problems of cognitive function (particularly attention) are common in HD, it could be argued that these problems are simply artifacts of other comorbid psychopathology. In particular, OCD, which is present in approximately one-fifth of individuals with HD (Frost et al., 2010), has been associated with impaired cognitive function (Greisberg & McKay, 2003; but see also Simpson et al., 2006). A similar argument could be made for depression, which can impair cognitive function (McDermott & Ebmeier, 2009) and is present in over half of individuals with HD (Frost et al., 2010). This issue has important implications for the current debate about whether HD should be considered distinct from OCD in DSM-5 (Mataix-Cols et al., 2010). If cognitive problems such as inattentiveness and impulsivity contribute to HD symptoms over and above the contribution of OCD, depression, and other psychiatric disorders, this would not

only support the argument for a separate HD diagnosis, but also highlight the importance of adding neurocognitive features to the current conceptual model of the disorder. Currently, the proposed DSM-5 diagnostic criteria highlight emotional distress and urges to save, but make no mention of neurocognitive functions.

The aim of the present study is to clarify the relationship between the core features of hoarding (clutter, difficulty discarding, acquiring), OCD symptoms, and ADHD symptoms. It is hoped that understanding the processes underlying hoarding behavior will facilitate treatment development, given the rather poor response of hoarding to traditional OCD treatments such as serotonergic antidepressants (Black et al., 1998; Mataix-Cols, Rauch, Manzo, Jenike, & Baer, 1999; Saxena, Brody, Maidment, & Baxter, 2007; Stein, Andersen, & Overo, 2007) and exposure and response prevention (Abramowitz, Franklin, Schwartz, & Furr, 2003; Mataix-Cols, Marks, Greist, Kobak, & Baer, 2002). We hypothesized that ADHD symptoms, but not OCD symptoms, would predict the core features of HD after controlling for general psychological distress. We further predicted that inattention would more strongly predict difficulty discarding, and that hyperactivity/impulsivity would more strongly predict acquiring behaviors.

Method

Participants

Eighty-seven adult participants met inclusion criteria of age 18–65; absence of lifetime bipolar, psychotic, or substance use disorders; absence of metal in the body or pregnancy (participants were primarily being recruited for a functional magnetic resonance imaging study), and (for the clinical groups) symptom duration of 1 year or more. Furthermore, participants were included if they could be classified into one of three diagnostic groups: *Hoarding* (primary diagnosis of hoarding, no diagnosis of non-hoarding OCD; $N = 32$), *OCD* (primary diagnosis of non-hoarding OCD, no diagnosis of hoarding; $N = 22$), or *Healthy Controls* (no lifetime psychiatric diagnosis or treatment; $N = 33$). Primacy of diagnoses was ascertained using clinical severity ratings (CSRs) from the *Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; Brown, DiNardo, & Barlow, 1994).

Materials

Psychiatric diagnoses were ascertained using the *ADIS-IV* (Brown et al., 1994). Reliability for the various DSM-IV categories contained in the ADIS-IV extends from good to excellent, with alpha coefficients ranging from .41–.86 (Brown, Di Nardo, Lehman, & Campbell, 2001). In addition, clinical ratings demonstrate strong inter-rater reliability for the different dimensions of the DSM-IV anxiety and mood disorders. Assessors were trained to criterion (100% agreement on diagnostic classification and within one CSR point on all diagnoses), with regular inter-rater reliability checks to prevent rater drift. Hoarding diagnoses were made using the *Hoarding Rating Scale-Interview* (HRS-I; Tolin, Frost, & Steketee, 2010), a semi-structured interview that assesses the severity of clutter, acquisition, difficulty discarding, distress, and impairment, each on a 0–8 scale. Internal consistency was excellent in this sample ($\alpha = .0.98$). HD participants received ratings of 4 (moderate) or greater on the clutter, difficulty discarding, and distress or impairment scales; non-HD participants did not meet this criterion, which reliably discriminates hoarding from non-hoarding participants (sensitivity = .97, specificity = .97) (Tolin, Frost, et al., 2010).

Severity of the core features of hoarding (clutter, difficulty discarding, acquiring) was assessed using the *Saving Inventory-Revised* (SI-R; Frost, Steketee, & Grisham, 2004), a 23-item questionnaire of compulsive hoarding severity. Internal consistency is excellent for the total score and for the 3 subscales. The SI-R readily discriminates hoarders from OCD

patients and community controls, and correlates significantly with ratings of clutter and impairment (Frost et al., 2004). Internal consistency was excellent in this sample (Clutter α = .99, Difficulty Discarding α = .97, Acquiring α = .93, Total α = .99).

Although the ADIS-IV includes queries about specific OCD symptom dimensions, the psychometric properties of these questions are not known. Therefore, severity of non-hoarding OCD was assessed using the *Obsessive Compulsive Inventory-Revised* (OCI-R; Foa et al., 2002), an 18-item self-report measure that assesses severity of different OCD symptoms (washing, checking, ordering, obsessing, hoarding, and neutralizing) using five-point scales. The OCI-R has good internal consistency, convergent validity, and test-retest reliability in patients with OCD, other anxiety disorders, and non-anxious controls (Abramowitz, Tolin, & Diefenbach, 2005; Foa et al., 2002; Huppert et al., 2007). For the purposes of the present study, the hoarding subscale of the OCI-R was omitted. Internal consistency was good in this sample (α = .88).

Severity of ADHD-like symptoms was assessed using the *ADHD Symptom Scale* (ADHDSS; Barkley & Murphy, 1998). Based on DSM-IV criteria for ADHD, this 18-item self-report measure is comprised of 4 subscales: Adult Inattention (e.g., “Fail to give close attention to details or make careless mistakes in my work”), Adult Hyperactivity/Impulsivity (e.g., “Interrupt or intrude on others”), Child Inattention, and Child Hyperactivity/Impulsivity. The ADHDSS readily discriminates ADHD patients from community control participants (Barkley, Murphy, DuPaul, & Bush, 2002), and shows good inter-rater reliability between patients and their parents and spouses (Murphy & Barkley, 1996). The ADHDSS subscales have shown excellent internal consistency in previous studies of compulsive hoarders (Hartl et al., 2005; Ratchford et al., 2009). Internal consistency was good to excellent in this sample (Adult Inattention α = .93, Adult Hyperactivity/Impulsivity α = .88, Child Inattention α = .94, Child Hyperactivity/Impulsivity α = .91). For purposes of the present study, the full ADHDSS was used to identify whether participants met symptom criteria for ADHD. Using the algorithm from *DSM-IV-TR* (American Psychiatric Association, 2000), participants were considered to meet symptom criteria if 6 or more of the Adult Inattention or 6 or more of the Adult Hyperactivity/Impulsivity items were rated “often” or “very often,” and at least one item was rated “often or “very often” on either of the child subscales. Only the 2 adult subscales (Inattention and Hyperactivity/Impulsivity) were used in the predictive analyses, as these subscales report on current symptoms.

Levels of general psychological distress were assessed using the *Depression Anxiety Stress Scale* (DASS; S. H Lovibond & P. F. Lovibond, 1995), a 42-item self-report measure that assesses symptoms of depression, anxiety, and stress over the past week on a 4-point scale. The three subscales of depression, anxiety, and stress have demonstrated good internal consistency, and factor analyses have supported the convergent and discriminant validity of the scales (P. F. Lovibond & S. H. Lovibond, 1995). In addition, the DASS has demonstrated adequate test-retest reliability, and adequately distinguished between clinician-rated mood and anxiety disorders (Brown, Chorpita, Korotitsch, & Barlow, 1997). Internal consistency was adequate to excellent in this sample (Depression α = .91, Anxiety α = .75, Stress α = .89).

Procedures

Participants were recruited via newspaper advertisements and flyers seeking volunteers for a functional magnetic resonance imaging (fMRI) study, details of which will not be described in this paper. It is worth noting that the hoarding participants were recruited specifically for hoarding or clutter problems, not for OCD, which may result in a more representative sample given the rather low rate of true OCD among hoarders. After providing written informed consent, participants met with a trained graduate-level interviewer who

administered the ADIS-IV and HRS-I. Once these measures were completed, participants completed a battery of self-report questionnaires including a demographics form, SI-R, OCI-R, DASS, and ADHDSS.

Results

Sample Characteristics

Table 1 shows that the OCD group was younger on average, and consisted of more men, than were the hoarding and healthy control groups. Therefore, subsequent analyses controlled for age and gender. Comorbid anxiety and depressive disorders were common in both the hoarding and OCD groups, and the hoarding group had a higher rate of depressive disorders than did the OCD group. Not surprisingly, the hoarding group exhibited higher SI-R scores than did the other two groups, and the OCD group exhibited higher (non-hoarding) OCI-R scores than did the other two groups. The hoarding and OCD groups did not differ significantly in terms of general distress (depression, anxiety, and stress), although both groups scored higher on these measures than did healthy controls. The hoarding group scored higher than did the OCD and healthy control group on the ADHDSS Attention subscale, and scored higher than did the healthy control group on the ADHDSS Hyperactivity/Impulsivity subscale. Compared to previously-collected normative data (Ratchford et al., 2009), the healthy control group scored < 1 *SD* below the normative mean on both adult subscales. The OCD group scored < 1 *SD* above the normative mean on both adult subscales. The HD group, on the other hand, scored 1.97 *SD* above the mean on the Adult Attention scale, and 1.53 *SD* above the normative mean on the Adult Hyperactivity/Impulsivity Scale. Thus, mean adult ADHDSS scores were clearly within the clinical range for HD participants, but not for the other groups. Consistent with this impression, 22% of HD participants, compared to 14% of OCD participants and 0% of healthy control participants, respectively, met symptom criteria for ADHD.

Predicting Hoarding Symptoms

For the prediction of hoarding symptoms, the three participant groups (HD, OCD, healthy) were combined in order to examine the full range of hoarding, OCD, ADHD, and mood symptoms. However, supplemental analyses examined the predictive models for each group separately, as described below. Four multiple linear regression analyses were conducted, predicting severity of each of the three symptoms of hoarding (clutter, difficulty discarding, acquiring) on the SI-R, as well as the SI-R total. Because of obtained group differences in age and gender (see above), these variables were entered in the first block. General distress variables (DASS depression, anxiety, stress) were entered in the second block. Non-hoarding OCD severity (OCI-R) was entered in the third block. Finally, current ADHD symptoms (ADHDSS Adult Attention, Adult Hyperactivity/Impulsivity) were entered in the fourth block.

Tables 2, 3, 4, and 5 depict the results of the regression analyses predicting clutter, difficulty discarding, and acquiring, as well as the SI-R total score, respectively for the total sample. In each case, a combination of demographic variables (age, gender) and general distress variables (depression, anxiety, stress) were significant predictors of the core features of hoarding. Non-hoarding OCD did not add predictive power to any of the models; i.e., OCD symptoms did not predict hoarding symptoms over and above general psychological distress. However, when adult ADHD symptoms (Inattention, Hyperactivity/Impulsivity) were added to the models, predictive capacity increased significantly in each case. Examination of beta weights in the final models indicated that age and Inattention (but not Hyperactivity/Impulsivity) symptoms were significant independent predictors of all three of the core features of hoarding. Given the prediction that Hyperactivity/Impulsivity would

uniquely predict acquiring, an exploratory regression analysis was conducted that omitted the 6 Adult Hyperactivity items, leaving only the 3 Impulsivity items; results were unchanged from the original analysis. Supplemental analyses were conducted for each group separately. None of the blocks significantly predicted SI-R scores in these analyses, likely due to lower *N* and decreased range of scores.

Discussion

Until very recently, hoarding has received relatively little empirical attention. This may be, in part, because of the assumption that hoarding was one of many symptoms of OCD. Increasingly, this notion is being challenged, with several authors calling for hoarding to become a unique diagnosis in DSM-V (Abramowitz et al., 2008; Pertusa et al., 2010; Phillips, 2009). Thus, it is important to re-examine the cognitive, emotional, behavioral, and neuropsychological aspects of this disorder in a new light, free of the assumption that hoarding is "just" a symptom of OCD [Indeed, epidemiologic evidence suggests that hoarding may be substantially more common than OCD (Samuels et al., 2008)].

One limitation of the present study is its reliance on self-reported symptoms of ADHD, although it is noted that inattention (along with other cognitive deficits) has also been observed in neuropsychological testing with hoarders (Grisham et al., 2007; Tolin, Villavicencio, et al., 2010). Furthermore, given the scope of the ADHDSS, only the symptom criteria for ADHD, rather than a formal diagnosis of ADHD, could be assigned. The formal diagnosis requires not only the presence of adult and childhood symptoms, but also impairment in two or more settings; clear evidence of clinically significant impairment in social, academic, or occupational functioning; and an exclusion of symptoms that occur exclusively during the course of developmental or psychotic disorders, or that are better accounted for by another mental disorder (American Psychiatric Association, 2000).

The relatively small sample size, though adequately powered for the present analyses, is an additional limitation in that the broad range of HD presentations might not have been fully captured. Likely under-represented in the present sample are non-Caucasian individuals, individuals with extremely poor insight who would not have self-identified as having HD and volunteered to participate in research, and patients meeting criteria for both OCD and HD, thought to reflect a small but possibly distinct group (Frost et al., 2010; Pertusa et al., 2010).

The present results suggest that inattentiveness is a key predictor of hoarding-related behaviors. These findings, along with the relative lack of prediction by OCD symptoms, lends further support to the growing sentiment that HD should be considered distinct from OCD (Mataix-Cols et al., 2010). Furthermore, it is noted that only a minority (22%) of the present HD sample met diagnostic symptom criteria for ADHD, suggesting that the observed relationship between attentional problems and hoarding symptoms cannot be easily attributed to the presence of a comorbid condition; rather, they suggest that problems of cognitive function might be central features of HD. This hypothesis would comport with findings of problems of decision-making in HD patients (e.g., Grisham et al., 2010; Lawrence et al., 2006), and extends those findings by suggesting that these decision-making problems are not solely the product of obsessional anxiety.

Contrary to prediction, Hyperactivity/Impulsivity scores did not uniquely predict the acquiring symptoms of hoarding. Rather, as was true of the other symptom dimensions, Inattention was the stronger predictor. Impulsivity does appear to be related to hoarding, as evidenced by neuropsychological testing (Grisham et al., 2007) and the elevated rates of hoarding behaviors among individuals with impulse control disorders (Frost et al., 2001;

Frost et al., 2002; Samuels et al., 2002). However, no study has yet determined whether impulsivity is uniquely associated with excessive acquisition among individuals with HD.

Greater appreciation of the importance of neurocognitive problems in hoarding may facilitate improvements in treatment development. Although a recently-developed cognitive-behavioral therapy (CBT) has shown promise for hoarding (Steketee, Frost, Tolin, Rasmussen, & Brown, 2010; Tolin, Frost, & Steketee, 2007), few patients achieve symptom remission and the treatment is hampered by problems of patient compliance. In both trials, the attention subscale of the ADHDSS correlated with completion of homework assignments (r's = −.42 and −.44) (Fabricant, Frost, Tolin, & Steketee, 2007), with greater pre-treatment inattentive symptoms associated with reduced CBT adherence. Adherence, in turn, is strongly associated with treatment outcome: in the initial trial, 80% of patients scoring at or above the median on homework completion were judged to be treatment responders, whereas only 20% of those scoring below the median on homework completion were treatment responders (Tolin et al., 2007).

Thus, there is increasing evidence that neurocognitive concerns (particularly problems of attention) underlie hoarding behaviors and serve as barriers to effective treatment. It might therefore be useful to examine methods of improving cognitive function, either as a monotherapy to treat the core features of hoarding (particularly difficulty discarding) or, more likely, as a means of enhancing the efficacy of cognitive-behavioral therapy. Pharmacotherapies for neurocognitive deficits, such as psychostimulant medications, might be one avenue. Stimulants such as methylphenidate have been shown to improve attention and related cognitive functions in placebo-controlled randomized controlled trials in children and adults with ADHD (Medori et al., 2008; Pliszka, 2007; Pliszka et al., 2006; Scheffler et al., 2009; Spencer et al., 2005). Behavioral approaches such as cognitive remediation (e.g., Luria, 1963) might be another alternative; several reviews (Cicerone et al., 2000; Cicerone et al., 2005; Rohling, Faust, Beverly, & Demakis, 2009) suggest that cognitive remediation can improve a variety of domains of neurocognitive function, and cognitive remediation is increasingly being explored in the treatment of traumatic brain injury (Galbiati et al., 2009), ADHD (O'Connell, Bellgrove, Dockree, & Robertson, 2006; Stevenson, Whitmont, Bornholt, Livesey, & Stevenson, 2002), and schizophrenia (Kurtz & Nichols, 2007; McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007). Interventions such as these might be expected to improve the efficacy of cognitive-behavioral therapy by increasing patients' capacity to learn new skills and to practice these skills regularly between sessions. Initial pilot testing with HD patients (Ayers, Bratiotis, Twamley, Wetherell, & Saxena, 2010; Tolin et al., unpublished data) suggests that cognitive remediation training can improve neurocognitive performance and potentially improve CBT outcomes in this population, although further study is needed.

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References

Abramowitz JS, Franklin ME, Schwartz SA, Furr JM. Symptom presentation and outcome of cognitive-behavioral therapy for obsessive-compulsive disorder. Journal of Consulting and Clinical Psychology 2003;71:1049–1057. [PubMed: 14622080]

Abramowitz JS, Tolin DF, Diefenbach GJ. Measuring change in OCD: Sensitivity of the Obsessive-Compulsive Inventory-Revised. Journal of Psychopathology and Behavioral Assessment 2005;27:317–325.

Abramowitz JS, Wheaton MG, Storch EA. The status of hoarding as a symptom of obsessive-compulsive disorder. Behaviour Research and Therapy 2008;46:1026–1033. [PubMed: 18684434]

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th Text Revision. Washington, DC: Author; 2000.

Anderson SW, Damasio H, Damasio AR. A neural basis for collecting behaviour in humans. Brain 2005;128:201–212. [PubMed: 15548551]

Ayers, CR.; Bratiotis, C.; Twamley, EW.; Wetherell, JL.; Saxena, S. Novel intervention for late life hoarding. Paper presented at the Annual Meeting of the International Obsessive-Compulsive Foundation; Washington, DC. 2010 Jul.

Barkley, RA.; Murphy, KR. Attention-Deficit Hyperactivity Disorder: A clinical workbook. 2. New York: Guilford Press; 1998.

Barkley RA, Murphy KR, DuPaul G, Bush T. Driving in young adults with attention deficit and hyperactivity disorder: Knowledge, performance, adverse outcomes, and the role of executive functioning. Journal of the International Neuropsychological Society 2002;8:655–672. [PubMed: 12164675]

Black DW, Monahan P, Gable J, Blum N, Clancy G, Baker P. Hoarding and treatment response in 38 nondepressed subjects with obsessive-compulsive disorder. Journal of Clinical Psychiatry 1998;59:420–425. [PubMed: 9721822]

Bloch MH, Landeros-Weisenberger A, Rosario MC, Pittenger C, Leckman JF. Meta-analysis of the symptom structure of obsessive-compulsive disorder. American Journal of Psychiatry. 2008

Brown TA, Chorpita BF, Korotitsch W, Barlow DH. Psychometric properties of the Depression Anxiety Stress Scales (DASS) in clinical samples. Behaviour Research and Therapy 1997;35:79–89. [PubMed: 9009048]

Brown TA, Di Nardo PA, Lehman CL, Campbell LA. Reliability of DSM-IV anxiety and mood disorders: implications for the classification of emotional disorders. Journal of Abnormal Psychology 2001;110:49–58. [PubMed: 11261399]

Brown, TA.; DiNardo, PA.; Barlow, DH. Anxiety Disorders Interview Schedule for DSM-IV. San Antonio, TX: The Psychological Corporation; 1994.

Cicerone KD, Dahlberg C, Kalmar K, Langenbahn DM, Malec JF, Bergquist TF, et al. Evidence-based cognitive rehabilitation: recommendations for clinical practice. Arch Phys Med Rehabil 2000;81:1596–1615. [PubMed: 11128897]

Cicerone KD, Dahlberg C, Malec JF, Langenbahn DM, Felicetti T, Kneipp S, et al. Evidence-based cognitive rehabilitation: updated review of the literature from 1998 through 2002. Arch Phys Med Rehabil 2005;86:1681–1692. [PubMed: 16084827]

Epstein JN, Johnson DE, Varia IM, Conners CK. Neuropsychological assessment of response inhibition in adults with ADHD. Journal of Clinical and Experimental Neuropsychology 2001;23:362–371. [PubMed: 11404813]

Fabricant, L.; Frost, RO.; Tolin, DF.; Steketee, G. The role of homework in the treatment of compulsive hoarding. Paper presented at the Annual Meeting of the Association of Behavioral and Cognitive Therapies; Philadelphia. 2007 Nov.

Foa EB, Huppert JD, Leiberg S, Langner R, Kichic R, Hajcak G, et al. The Obsessive-Compulsive Inventory: Development and validation of a short version. Psychological Assessment 2002;14:485–496. [PubMed: 12501574]

Frost RO, Gross R. The hoarding of possessions. Behaviour Research and Therapy 1993;31:367–382. [PubMed: 8512538]

Frost RO, Hartl TL. A cognitive-behavioral model of compulsive hoarding. Behaviour Research and Therapy 1996;34:341–350. [PubMed: 8871366]

Frost RO, Kim HJ, Morris C, Bloss C, Murray-Close M, Steketee G. Hoarding, compulsive buying and reasons for saving. Behaviour Research and Therapy 1998;36:657–664. [PubMed: 9682522]

Frost RO, Meagher BM, Riskind JH. Obsessive-compulsive features in pathological lottery and scratch ticket gamblers. Journal of Gambling Studies 2001;17:5–19. [PubMed: 11705017]

Frost RO, Steketee G, Grisham J. Measurement of compulsive hoarding: Saving Inventory-Revised. Behaviour Research and Therapy 2004;42:1163–1182. [PubMed: 15350856]

Frost, RO.; Steketee, G.; Tolin, DF.; Glossner, K. Diagnostic comorbidity in hoarding and OCD. Paper presented at the Meeting of the World Congress of Behavioral and Cognitive Therapies; Boston. 2010 Jun.

Frost RO, Steketee G, Williams L. Hoarding: a community health problem. Health and Social Care in the Community 2000;8:229–234. [PubMed: 11560692]

Frost RO, Steketee G, Williams L. Compulsive buying, compulsive hoarding, and obsessive-compulsive disorder. Behavior Therapy 2002;33:201–214.

Frost RO, Tolin DF, Steketee G, Fitch KE, Selbo-Bruns A. Excessive acquisition in hoarding. J Anxiety Disord 2009;23:632–639. [PubMed: 19261435]

Galbiati S, Recla M, Pastore V, Liscio M, Bardoni A, Castelli E, et al. Attention remediation following traumatic brain injury in childhood and adolescence. Neuropsychology 2009;23:40–49. [PubMed: 19210031]

Greisberg S, McKay D. Neuropsychology of obsessive-compulsive disorder: a review and treatment implications. Clin Psychol Rev 2003;23:95–117. S0272735802002325 [pii]. [PubMed: 12559996]

Grisham JR, Brown TA, Savage CR, Steketee G, Barlow DH. Neuropsychological impairment associated with compulsive hoarding. Behaviour Research and Therapy 2007;45:1471–1483. [PubMed: 17341416]

Grisham JR, Norberg MM, Williams AD, Certoma SP, Kadib R. Categorization and cognitive deficits in compulsive hoarding. Behav Res Ther 2010;48:866–872. S0005-7967(10)00107-5 [pii]. 10.1016/j.brat.2010.05.011 [PubMed: 20542489]

Hartl TL, Duffany SR, Allen GJ, Steketee G, Frost RO. Relationships among compulsive hoarding, trauma, and attention-deficit/hyperactivity disorder. Behaviour Research and Therapy 2005;43:269–276. [PubMed: 15629755]

Hartl TL, Frost RO, Allen GJ, Deckersbach T, Steketee G, Duffany SR, et al. Actual and perceived memory deficits in individuals with compulsive hoarding. Depression and Anxiety 2004;20:59–69. [PubMed: 15390215]

Huppert JD, Walther MR, Hajcak G, Yadin E, Foa EB, Simpson HB, et al. The OCI-R: Validation of the subscales in a clinical sample. Journal of Anxiety Disorders 2007;21:394–406. [PubMed: 16814981]

Iervolino AC, Perroud N, Fullana MA, Guipponi M, Cherkas L, Collier DA, et al. Prevalence and heritability of compulsive hoarding: A twin study. American Journal of Psychiatry. in press.

Kessler RC, Green JG, Adler LA, Barkley RA, Chatterji S, Faraone SV, et al. Structure and diagnosis of adult attention-deficit/hyperactivity disorder: analysis of expanded symptom criteria from the Adult ADHD Clinical Diagnostic Scale. Arch Gen Psychiatry 2010;67:1168–1178. 67/11/1168 [pii]. 10.1001/archgenpsychiatry.2010.146 [PubMed: 21041618]

Kurtz MM, Nichols MC. Cognitive rehabilitation for schizophrenia: A review of recent advances. Current Psychiatry Reviews 2007;3:213–221.

Lawrence NS, Wooderson S, Mataix-Cols D, David R, Speckens A, Phillips ML. Decision making and set shifting impairments are associated with distinct symptom dimensions in obsessive-compulsive disorder. Neuropsychology 2006;20:409–419. [PubMed: 16846259]

Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behaviour Research and Therapy 1995;33:335–343. [PubMed: 7726811]

Lovibond, SH.; Lovibond, PF. Manual for the Depression Anxiety Stress Scales. Sydney: The Psychology Foundation of Australia; 1995.

Luria, AR. Restoration of brain function after injury. New York: Macmillan; 1963.

Mataix-Cols D, Frost RO, Pertusa A, Clark LA, Saxena S, Leckman JF, et al. Hoarding disorder: a new diagnosis for DSM-V? Depress Anxiety 2010;27:556–572.10.1002/da.20693 [PubMed: 20336805]

Mataix-Cols D, Marks IM, Greist JH, Kobak KA, Baer L. Obsessive-compulsive symptom dimensions as predictors of compliance with and response to behaviour therapy: results from a controlled trial. Psychother Psychosom 2002;71:255–262. [PubMed: 12207105]

Mataix-Cols D, Rauch SL, Manzo PA, Jenike MA, Baer L. Use of factor-analyzed symptom dimensions to predict outcome with serotonin reuptake inhibitors and placebo in the treatment of obsessive-compulsive disorder. Am J Psychiatry 1999;156:1409–1416. [PubMed: 10484953]

McDermott LM, Ebmeier KP. A meta-analysis of depression severity and cognitive function. J Affect Disord 2009;119:1–8. S0165-0327(09)00170-0 [pii]. 10.1016/j.jad.2009.04.022 [PubMed: 19428120]

McGurk SR, Twamley EW, Sitzer DI, McHugo GJ, Mueser KT. A meta-analysis of cognitive remediation in schizophrenia. American Journal of Psychiatry 2007;164:1791–1802. [PubMed: 18056233]

Medori R, Ramos-Quiroga JA, Casas M, Kooij JJ, Niemela A, Trott GE, et al. A randomized, placebo-controlled trial of three fixed dosages of prolonged-release OROS methylphenidate in adults with attention-deficit/hyperactivity disorder. Biological Psychiatry 2008;63:981–989. [PubMed: 18206857]

Murphy K, Barkley RA. Attention deficit hyperactivity disorder adults: comorbidities and adaptive impairments. Comprehensive Psychiatry 1996;37:393–401. [PubMed: 8932963]

O'Connell RG, Bellgrove MA, Dockree PM, Robertson IH. Cognitive remediation in ADHD: effects of periodic non-contingent alerts on sustained attention to response. Neuropsychol Rehabil 2006;16:653–665. [PubMed: 17127571]

Pertusa A, Frost RO, Fullana MA, Samuels J, Steketee G, Tolin D, et al. Refining the diagnostic boundaries of compulsive hoarding: a critical review. Clin Psychol Rev 2010;30:371–386. S0272-7358(10)00020-6 [pii]. 10.1016/j.cpr.2010.01.007 [PubMed: 20189280]

Phillips, KA. Report of the DSM-V anxiety, obsessive-compulsive spectrum, posttraumatic, and dissociative disorders work group. 2009. Retrieved June 5, 2009, from http://www.psych.org/MainMenu/Research/DSMIV/DSMV/DSMRevisionActivities/DSM-V-Work-Group-Reports/Anxiety-Obsessive-Compulsive-Spectrum-Posttraumatic-and-Dissociative-Disorders-Work-Group-Report.aspx

Pliszka SR. Practice parameter for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity disorder. Journal of American Academy of Child and Adolescent Psychiatry 2007;46:894–921.

Pliszka SR, Crismon ML, Hughes CW, Corners CK, Emslie GJ, Jensen PS, et al. The Texas Children's Medication Algorithm Project: revision of the algorithm for pharmacotherapy of attention-deficit/hyperactivity disorder. Journal of the American Academy of Child and Adolescent Psychiatry 2006;45:642–657. [PubMed: 16721314]

Rasmussen SA, Eisen JL. The epidemiology and clinical features of obsessive compulsive disorder. Psychiatric Clinics of North America 1992;15:743–758. [PubMed: 1461792]

Ratchford, E.; Frost, R.; Steketee, G.; Tolin, DF. ADHD in hoarders, OCD patients, and community controls. Paper presented at the Annual Meeting of the Association of Behavioral and Cognitive Therapies; New York. 2009 Nov.

Rohling ML, Faust ME, Beverly B, Demakis G. Effectiveness of cognitive rehabilitation following acquired brain injury: a meta-analytic re-examination of Cicerone et al.'s (2000, 2005) systematic reviews. Neuropsychology 2009;23:20–39. [PubMed: 19210030]

Samuels JF, Bienvenu OJ, Grados MA, Cullen B, Riddle MA, Liang KY, et al. Prevalence and correlates of hoarding behavior in a community-based sample. Behaviour Research and Therapy 2008;46:836–844. [PubMed: 18495084]

Samuels JF, Bienvenu OJ, Riddle MA, Cullen BA, Grados MA, Liang KY, et al. Hoarding in obsessive compulsive disorder: results from a case-control study. Behaviour Research and Therapy 2002;40:517–528. [PubMed: 12043707]

Saxena S, Brody AL, Maidment KM, Baxter LR Jr. Paroxetine treatment of compulsive hoarding. Journal of Psychiatric Research 2007;41:481–487. [PubMed: 16790250]

Scheffler RM, Brown TT, Fulton BD, Hinshaw SP, Levine P, Stone S. Positive association between attention-deficit/ hyperactivity disorder medication use and academic achievement during elementary school. Pediatrics 2009;123:1273–1279. [PubMed: 19403491]

Sheppard B, Chavira D, Azzam A, Grados MA, Umana P, Garrido H, et al. ADHD prevalence and association with hoarding behaviors in childhood-onset OCD. Depression and Anxiety 2010;27:667–674.10.1002/da.20691 [PubMed: 20583294]

Simpson HB, Rosen W, Huppert JD, Lin SH, Foa EB, Liebowitz MR. Are there reliable neuropsychological deficits in obsessive-compulsive disorder? J Psychiatr Res 2006;40:247–257. [PubMed: 15950242]

Spencer T, Biederman J, Wilens T, Doyle R, Surman C, Prince J, et al. A large, double-blind, randomized clinical trial of methylphenidate in the treatment of adults with attention-deficit/hyperactivity disorder. Biological Psychiatry 2005;57:456–463. [PubMed: 15737659]

Stein DJ, Andersen EW, Overo KF. Response of symptom dimensions in obsessive-compulsive disorder to treatment with citalopram or placebo. Rev Bras Psiquiatr 2007;29:303–307. [PubMed: 18200396]

Steketee G, Frost RO, Tolin DF, Rasmussen J, Brown TA. Waitlist-controlled trial of cognitive behavior therapy for hoarding disorder. Depression and Anxiety 2010;27:476–484.10.1002/da.20673 [PubMed: 20336804]

Stevenson CS, Whitmont S, Bornholt L, Livesey D, Stevenson RJ. A cognitive remediation programme for adults with Attention Deficit Hyperactivity Disorder. Australian and New Zealand Journal of Psychiatry 2002;36:610–616. [PubMed: 12225443]

Storch EA, Lack CW, Merlo LJ, Geffken GR, Jacob ML, Murphy TK, et al. Clinical features of children and adolescents with obsessive-compulsive disorder and hoarding symptoms. Comprehensive Psychiatry 2007;48:313–318. [PubMed: 17560950]

Tolin DF, Frost RO, Steketee G. An open trial of cognitive-behavioral therapy for compulsive hoarding. Behaviour Research and Therapy 2007;45:1461–1470. [PubMed: 17306221]

Tolin DF, Frost RO, Steketee G. A brief interview for assessing compulsive hoarding: The Hoarding Rating Scale-Interview. Psychiatry Research 2010;178:147–152. S0165-1781(09)00178-4 [pii]. 10.1016/j.psychres.2009.05.001 [PubMed: 20452042]

Tolin DF, Frost RO, Steketee G, Gray KD, Fitch KE. The economic and social burden of compulsive hoarding. Psychiatry Research 2008;160:200–211. [PubMed: 18597855]

Tolin, DF.; Villavicencio, A.; Umbach, A.; Kurtz, MM. Neuropsychological functioning in hoarding disorder. 2010. Submitted for publication

Wu KD, Watson D. Hoarding and its relation to obsessive-compulsive disorder. Behaviour Research and Therapy 2005;43:897–921. [PubMed: 15896286]

Table 1

Sample Characteristics

	Hoarding (*N* = 32)	**OCD (*N* = 22)**	**Healthy Control (*N* = 33)**	***F***	χ^2
Age	49.59 (9.21)[a]	31.38 (12.20)[b]	47.35 (12.30)[a]	23.04**	
Female	26 (81%)	5 (23%)	27 (82%)		25.59**
White	29 (91%)	20 (91%)	30 (91%)		0.002
Comorbid anxiety disorder	15 (47%)	7 (32%)	0 (0%)		1.22[1]
Comorbid depressive disorder	19 (59%)	6 (27%)	0 (0%)		5.40*[1]
SI-R Clutter	27.00 (6.25)[a]	4.72 (6.34)[b]	1.68 (2.54)[b]	241.16**	
SI-R Difficulty Discarding	20.71 (4.09)[a]	4.80 (5.27)[b]	1.62 (2.11)[c]	239.97**	
SI-R Acquiring	16.38 (5.30)[a]	3.72 (3.35)[b]	2.11 (2.12)[b]	140.83**	
DASS Depression	10.92 (10.34)[a]	8.62 (7.22)[a]	0.86 (1.46)[b]	18.66**	
DASS Anxiety	5.23 (5.24)[a]	6.31 (6.39)[a]	1.14 (1.97)[b]	11.24**	
DASS Stress	10.72 (8.25)[a]	13.54 (10.47)[a]	2.38 (3.12)[b]	19.51**	
OCI-R (without hoarding)	10.13 (7.93)[a]	18.92 (8.88)[b]	1.51 (1.41)[c]	52.22**	
ADHDSS Adult Inattention	11.38 (6.04)[a]	6.33 (6.19)[b]	1.53 (2.06)[c]	32.92**	
ADHDSS Adult Hyperactivity/ Impulsivity	7.38 (5.33)[a]	4.71 (4.90)	1.94 (1.86)[b]	13.86**	
Meets ADHD Symptom Criteria	7 (22%)	3 (14%)	0 (0%)		7.78**

** $p < .001$. Within each row, groups with different superscript letters are significantly different ($p < .05$).

[1] Comparison between hoarding and OCD participants only.

Table 2

Results of Linear Regression Predicting SI-R Clutter

Block	Variables	β	*t*	R^2	R^2 change
1	Age	.262*	2.97*	.093	.093*
	Gender	.006	−0.25		
2	DASS Depression	.154	1.53	.374	.281**
	DASS Anxiety	.080	1.04		
	DASS Stress	−.039	−0.57		
3	OCI-R (non-hoarding)	−.008	−0.15	.374	.000
4	ADHDSS Attention	.703**	4.14**	.559	.185**
	ADHDSS Hyperactivity	−.170	−1.19		

* $p < .05$.

** $p < .001$. β = standardized coefficient in the final model.

Table 3

Results of Linear Regression Predicting SI-R Difficulty Discarding

Block	Variables	β	*t*	R^2	R^2 change
1	Age	.287*	3.01*	.087	.087*
	Gender	.046	0.42		
2	DASS Depression	.011	0.11	.351	.263**
	DASS Anxiety	.083	0.79		
	DASS Stress	−.026	−0.22		
3	OCI-R (non-hoarding)	.155	1.48	.368	.018
4	ADHDSS Attention	.686**	4.24**	.575	.206**
	ADHDSS Hyperactivity	−.107	−0.75		

* $p < .05$.

** $p < .001$. β = standardized coefficient in the final model.

Table 4

Results of Linear Regression Predicting SI-R Acquiring

Block	Variables	β	*t*	R^2	R^2 change
1	Age	.260*	2.74*	.125	.125*
	Gender	.112	1.26		
2	DASS Depression	.217*	2.31*	.475	.350**
	DASS Anxiety	.178	1.92		
	DASS Stress	−.086	−0.95		
3	OCI-R (non-hoarding)	.022	0.08	.476	.001
4	ADHDSS Attention	.476*	2.98*	.624	.147**
	ADHDSS Hyperactivity	.030	0.34		

* $p < .05$.

** $p < .001$. β = standardized coefficient in the final model.

Table 5

Results of Linear Regression Predicting SI-R Total Score

Block	Variables	β	*t*	R^2	R^2 change
1	Age	.292*	3.11*	.102	.102*
	Gender	.033	0.34		
2	DASS Depression	.138	1.35	.411	.310**
	DASS Anxiety	.131	1.25		
	DASS Stress	−.072	−0.59		
3	OCI-R (non-hoarding)	.045	0.44	.415	.003
4	ADHDSS Attention	.658**	4.13**	.601	.187**
	ADHDSS Hyperactivity	−.102	−0.72		

* $p < .05$.

** $p < .001$. β = standardized coefficient in the final model.